National Aeronautics and Space Administration

Sustainability Report
Ames Research Center
2012

Table of Contents

Acknowledgments

We want to thank the many members of the Ames Green Team, the Ames Environmental Management Division, and its support services contractors ISSi and Deltha-Critique, for providing information and reviewing drafts of the report.

Photographs were provided by NASA.

This report was printed on 100% post-consumer waste color copy paper.

This report is available at http://environment.arc.nasa.gov

Available from:

NASA Center for AeroSpace Information

7115 Standard Drive

Hanover, MD 21076-1320

(301) 621-0390

National Technical Information Service

5285 Port Royal Road

Springfield, VA 22161

(703) 487-4650

Letter from the Center Director

"NASA Ames Leadership in Sustainability"

A Culture of Sustainability

NASA Ames' institutional focus positions it as a sustainability advocate. Core missions include monitoring Earth systems, advancing 'green' aeronautics, developing information technologies and operating highly efficient, cutting-edge computation resources, and seeking life's potential beyond Earth. NASA enables human exploration beyond Earth, including development of self-contained, sustainable, autonomous habitats for transit and for living in lunar and planetary environments. This is 'sustainability' extraordinaire—the sustainability of planetary biospheres and the sustainability of human teams in remote outposts maximizing local environmental resources while minimizing local impacts. Our missions can combine with stewardship of our built infrastructure and attitudes towards sustainability can reach across institutional and programmatic management in the interests of both.

One of the greatest challenges we face today is climate change. Mitigation requires understanding essential causes and effects, our current situation, anticipating future trends, and both designing and implementing responsive changes on a global scale. NASA's iconic image of Earth as 'the pale blue dot' hanging in space has become synonymous with efforts to raise awareness of our planet as a living system. We must become better stewards of this world, sustainably utilizing our limited natural resources. NASA is committed to continuing its leadership in scientific discovery and technological innovation addressing Earth's critical challenges.

Dr. S. Pete Worden
Center Director
NASA Ames Research Center

Introduction

Welcome to the NASA Ames Research Center's Sustainability Report for 2012. The following pages highlight the various environmental issues addressed at Ames, and the Center's accomplishments over the past year.

In an effort to manage its environmental resources, NASA follows Executive Order (EO) 13423 of January 24, 2007. Additionally, NASA follows EO 13514 of October 5, 2009, which strengthened many provisions detailed in EO 13423. These EOs set broad goals to strengthen environmental, energy, and transportation management across Federal agencies. They consolidate previously issued EO's and require Federal agencies to implement Environmental Management Systems (EMS) at all appropriate organizational levels. They then require the use of EMS as the primary management approach for addressing environmental aspects of internal agency operations and activities, including energy and transportation functions. EMS compliance is equivalent to ISO 14001 compliance. NASA Ames EMS is conformant with the White House Council of Environmental Quality Requirements. NASA is implementing the EO goals, in large part, through the NASA Strategic Sustainability Performance Plan. To implement the plan, the NASA Ames Environmental Management Division is spearheading an internal Ames 'Green Team' which is focused on strengthening the Center's environmental management system, including outreach through websites, a variety of forums, and topical fact sheets. This Green Team participates in the Sustainable Silicon Valley, and other organizations that share information and collaborate in finding common solutions to such challenges as clean transportation, energy and water conservation, chemical management, and green purchasing. Sustainability for NASA Ames is consistent with the Space Act of 1958, NASA policy on Environmental Quality (14 CFR subpart 1216.1) and NASA's strategic goals. The NASA 2011 Strategic Plan vision is to reach for new heights and reveal the unknown, so that what NASA does and learns will benefit all humankind and its mission is to "drive advances in science, technology, and exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of Earth." NASA Ames contributes to the Agency's overarching strategy of "Committing to environmental stewardship through Earth observation and science, and the development and use of green technologies and capabilities in NASA missions and facilities" in part through many of the efforts described in the following pages. Ames also celebrates the accomplishments of its personnel in furthering Center sustainability goals through annual Earth Day events, Ames Honor Awards for Sustainability, and other activities.

EO 13514: "Sustainability" and "Sustainable" mean to create and maintain conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations.

Part of the Sustainabilty Base building at NASA Ames

The National Environmental Policy Act of 1969

The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.

About NASA Ames

NASA Ames Research Center at Moffett Field, California, was founded December 20, 1939 as an aircraft research laboratory by the National Advisory Committee for Aeronautics (NACA).

NASA Ames Research Center at Moffett Field, California, was founded December 20, 1939 as an aircraft research laboratory by the National Advisory Committee for Aeronautics (NACA). With the passage of the Space Act in 1958, the National Aeronautics and Space Administration (NASA) was created, replacing NACA. NASA Ames is one of ten NASA field installations and is uniquely situated at the core of the research cluster of high-tech companies, universities, and laboratories in Silicon Valley that define the region's character. Ames' wind tunnels, office buildings, hangars, and airfield are a significant presence in the community. With more than $3.0 billion in capital equipment, 1,280 civil servants and approximately the same number of on-site contractors, and a $600 million annual budget, Ames' economic impact is significant.

Currently, Ames is making history by forging ahead with its small, inexpensive satellite missions and is at the forefront in astrobiology, supercomputing, robotic lunar exploration, the search for habitable planets, intelligent/adaptive systems, advanced thermal protection, and airborne astronomy. Ames also develops strategic private sector partnerships to further space exploration, create innovative technologies, and foster interdisciplinary scientific discoveries in Earth and space sciences. To find out more about the exciting work being done at the NASA Ames Research Center visit www.nasa.gov/centers/ames/home/index.html.

NASA Research Park

In addition, Ames is redeveloping the former Naval Air Station at Moffett Field into the NASA Research Park (NRP). The NRP has been successful in creating strategic partnerships with academic, non-profit, and industry partners dedicated to advancing the goals of the NASA Research Park.

Over the next fifteen years, the NRP is estimated to have a positive economic impact on the area, generating an additional 21,300 local jobs and an additional $5.8 billion in annual economic output. To find out more about the NRP visit www.nasa.gov/centers/ames/researchpark/home/index.html.

Below: NASA Research Park entrance sign.

Bottom: Artist's rendering of future campus in full operation.

Aerial of NASA Ames Research Center 2012, including the newly constucted Sustainablilty Base buidling.

High Performance Facilities

Ongoing opportunities to incorporate green building design elements will save costs and reduce environmental impacts.

EO 13514 AGENCY-WIDE GOALS TO IMPLEMENT HIGH PERFORMANCE SUSTAINABLE FEDERAL BUILDING DESIGN, CONSTRUCTION, OPERATION & MANAGEMENT, MAINTENANCE, AND DECONSTRUCTION BY:

1. Beginning in 2020, ensure that all new buildings that enter the planning process are designed to achieve zero-net-energy by 2030.
2. Ensure that all new construction, major renovation, or repair and alteration of Federal buildings complies with the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings.
3. Ensure that at least 15% of the agency's existing buildings and building leases (> 5,000 gross sq ft) meet the Guiding Principles by fiscal year 2015 and that the Agency makes annual progress toward 100% conformance with the Guiding Principles for its building inventory.
4. Pursue cost-effective, innovative strategies to minimize consumption of energy, water, and materials.
5. Manage existing building systems to reduce the consumption of energy, water, and materials, and identifying alternatives to renovation that reduce existing assets' deferred maintenance costs.
6. Ensure that rehabilitation of federally owned historic buildings are retrofitted to promote long-term viability.

Every building's true, full life-cycle investment includes capital costs of design and construction, removal of associated debris, operating expenses (maintenance, energy, water, and waste removal), and additionally the cost of greenhouse gas emissions resulting from the materials used in the building, furnishing, and continued operations (including transportation contributions from employees) and non-recoverable non-renewable resources that may be consumed in the facility during associated work efforts.

Green buildings, and green building materials, offer cost savings to this perspective.

Ames maintains 127 buildings with a total interior space of over 3 million square feet. Ongoing opportunities to incorporate green building design elements will save continuing operating costs and reduce environmental impacts. The Engineering and Real Property Management and the Environmental Management Divisions focus on selecting green materials and equipment for renovations. About 44% of the facilities on the Ames Campus, and 70% of the NASA Research Park and Eastside/Airfield, have exceeded their predicted life. NASA policy requires new construction and renovations to minimally meet the Leadership in Energy and Environmental Design (LEED) Silver standard maintained by the U.S. Green Building Council. Having recently completed a new 50,000 square foot facility at a LEED Platinum rating (see Sustainability Base, to follow), Ames hopes to address several new construction projects in the near future.

Nationally Significant Facilities

In coordination with NASA Headquarters, Ames has stewardship over nationally significant facilities. These facilities carry out important research and development work and often contribute to broad sustainability efforts, such as improvements in the efficiency of commercial aviation. Ames is working to "green" these facilities which, due to their age and/or specialized functions, often have substantial energy, water, and other resource use requirements.

Aerial view of Ames Sustainability Base

Ames Sustainability Base

In the heart of California's Silicon Valley, NASA Ames has created an Earth-based space-age facility integrating our expertise in aeronautics and space exploration. Sustainability Base (SB) is a 50,000sf mixed-use environment, a technology demonstration, a continuing test-bed and a dissemination tool for novel building design and operation best practices. Certified by the US Green Building Council's Leadership in Engineering and Environmental Design (LEED) qualification at the Platinum (highest) level in April 2012, it applies NASA technology to the built environment.

The facility's construction contract was awarded July 2009; 40th anniversary of the establishment of the first lunar outpost. Sustainability Base was named in kinship with Tranquility Base, sustainability's state-of-the-art in 1969.

Facilities (cont.)

Above: Sustainability Base upstairs open floor plan, efficient window designs, and solor roof panels

Below: Exterior front of builing with drought-tolerant low maintenance landscpaing

In Sustainability Base, advanced technologies combine with practical execution, the facility draws from its geophysical location and comprehensive design and operational choices support the comfort and productivity of the inhabitants. Energy efficiency is secured, first, through conscientious 'Native to Place' design. Local sources and sinks for heating, cooling, and energy storage align with ambient opportunities for ventilation, lighting, and shading. Under a grassy oval in the nearby NASA Research Park lies the heart of Sustainability Base's geothermal system: 106 interconnected well bores averaging 140 ft (42.7m) deep. Water circulates in a 15,000 ft (~ 5km) closed-loop system of 1 in. (2.54cm) pipes lying within 6 in. (15 cm). The circulated water is 'conditioned' by the thermal inertia of the surrounding ground to a temperature of 58°F (14.5°C). This water is boosted up (warmed) or down (chilled) by heat exchangers to supply radiators, ceiling mounted chill panels, and limited underfloor radiant systems. The combined system (geothermal wells, water pumps, heat exchangers, radiant deployment) is more energy efficient than traditional methods that heat, cool, and blow air using natural gas and electricity, and maximally leverages the local environment. Large window banks and skylights combine with a narrow footprint to maximize natural daylight. Structural elements are external, maximizing interior spaces, minimizing thermal load, and adding visual elements consonant with nearby wind tunnels. A solar thermal assembly supplements domestic hot water. On-site net-metered energy generation includes photovoltaic panels and a solid oxide fuel cell. Space-age innovations are applied to maximize energy efficiency, minimize water use, and generate flexible, adaptable, and comfortable spaces to satisfy the needs of the facility's residents.

Part of a water recycler at Ames

Sustainability Base's water conservation

NASA Ames brings the 'NASA Inside' touch to Sustainability Base, demonstrating synergy between terrestrial and space applications in NASA-developed water recycling. Thoughtful incorporation of double-piping in SB's construction allows isolation of grey water from sinks and showers. The once-used water is piped off-site nearby, where it will be reclaimed in a three-stage process, returned to the facility, and used secondarily in low flow urinals and toilets. The technology uses both forward and reverse osmosis and relies on specially engineered osmotic membranes. The process was developed in the Bioengineering Branch of the Ames Space Biosciences Division by Dr. Michael Flynn and his collaborators. It was designed for implementations such as the International Space Station. The Sustainability Base deployment is a larger and longer term beta-test than has previously been possible, and will generate important data on maintenance practices. Reclaiming grey water lowers potable water consumption by approximately 60%. This recycling is combined with use of locally recovered and remediated Superfund site groundwater for irrigation and landscaping solutions. Drought tolerant native plants, bioswales that minimize run-off, and a 6000 gallon on-site remediated ground water storage tank add additional elements to the design. As a result, the facility requires, overall, only 10% the potable water of comparably sized facilities.

Sustainability Base's energy conservation

Sustainability Base has been designed to take advantage of the climate in Santa Clara Valley, on the edge of San Francisco Bay. The primary heating and cooling systems take advantage of the prevailing deep ground temperature, year-round, of 58°F (14.4°C).

Facilities (cont.)

These 'native to place' solutions combine with on-site electricity generation for the comfort and productivity of the building's residents.

Earth's first installation of the second generation Energy Server (ES-5700), or BloomBox®, from Bloom Energy can more than provide for the facility's electricity demand. This solid oxide fuel cell produces about 200kW of electrical power by chemical reaction with steam and air, rather than combustion, reducing CO2 green house gas emissions by 40%. The fuel cell's efficiency is estimated at 55%, roughly twice that of a conventional gas-fired power plant. With its small size and low profile, this dynamo is surprisingly unnoticeable—close by there is only a low hum. This pilot installation is constantly monitored by NASA Ames and Bloom Energy to analyze and optimize operations.

Sustainability Base also harnesses the Sun, with 432 SunPower® E-19 photovoltaic panels distributed across the building's roof. These arrays are 19% efficient in converting incident photons to harvested electrons, among the highest conversion efficiencies commercially available. At peak output, the arrays will produce 87kW. This may be at or above Sustainability Base's peak demand. Over the course of a year, PV-generation can account for approximately 30% of the building's electricity needs. Both the solar and fuel cell power generation are measured and their contribution of excess energy to the electricity grid is a net benefit to NASA Ames.

Also located up on the white polyvinylchloride (PVC) 'cool roof' is another solar collection assembly, this time solar thermal. The Sun heats water for sinks and showers, further reducing the building's need for electricity or natural gas. Sustainability Base is a powerhouse, using its location and climate optimally and harnessing its resources and demands ambitiously.

Sustainability Base roof, Sunpower photovoltaic array

Bloom Energy Box, outside of the Sustainability Base

Sustainability Base's advanced energy partnerships

Sustainability Base reaches out to public and private sector partners interested in advancing sustainability goals and utilizing the building as a testbed. An Interagency Agreement with DOE's Lawrence Berkeley National Laboratories' Energy Efficient Building Systems Regional Innovation Cluster has produced an EnergyPlus operational model of the facility's energy use. A Non-Reimbursable Space Act Agreement with Integrated Building Solutions produced the Energy Dashboard that greets visitors to the facility, revealing real-time energy generation and demand and displaying other real-time data. Plug load management instruments from Enmetric Systems are deployed in the second floor North wing. Enmetric contributes active consultation on this project, and student interns are analyzing acquired data to evaluate performance and modify parameters. Partnership agreements have recently been concluded with Autodesk and Verdigris Technologies for investigating Building Information Modeling for high performance facilities and plug-load management, respectively.

Facilities (cont.)

NASA Advanced Supercomputing Facility

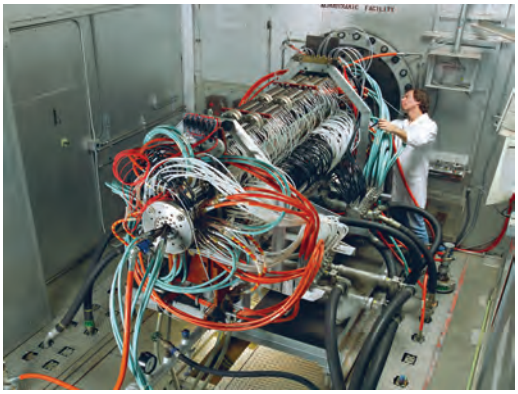
The NASA Advanced Supercomputing Facility (NAS) was dedicated in March 1987. It was established to act as a pathfinder in advanced, large-scale computing system capabilities through the use of the latest hardware and software technology and to house NASA Ames' supercomputers. In 2004, the NAS Division co-developed, with industry partners SGI and Intel, what was initially the fastest supercomputer in the world. Named Columbia, the supercomputer is a 10,240-processor SGI Altix supercluster. Columbia remains NASA's fastest supercomputer, and it is used by scientists and engineers at almost every NASA center.

Columbia was intentionally designed using sustainability principles by creating platforms that allow continuous upgrading of systems. The new uninterruptible power supply system will use quiet and clean technology. In 2008, the NAS team cut the need for one 450-ton chiller, decreasing the need for 11 megawatts of power. It also increased the computing power eight-fold making it the third fastest computer in the world. Visit the NAS website at http://www.nas.nasa.gov/

Ames' Columbia Supercomputer

Arc Jet Complex

The Ames Arc Jet Complex has seven available test bays located in two separate laboratory buildings. At the present time, four bays contain Arc Jet units of differing configurations that are serviced by common facility support equipment. These are the Aerodynamic Heating Facility (AHF) and Turbulent Flow Duct (2x9) in Building N-234 and the Panel Test Facility (PTF) and the Interactive Heating Facility (IHF) in Building N-238. The support equipment includes two D.C. power supplies, a steam ejector driven vacuum system, a water-cooling system, high-pressure gas systems, data acquisition system, and other auxiliary systems.



NASA Ames Interaction Heating Facility (IHF) arc jet heater

The large magnitude and capacity of these systems makes the Ames Arc Jet Complex unique in the world.

The largest power supply can deliver 75 MW for a 30 minute duration or 150 MW for a 15 second duration.

This power capacity, in combination with a high-volume 5-stage steam ejector vacuum-pumping system, enables facility operations to match high-altitude atmospheric flight conditions with relatively large size samples. The arc heaters, when combined with a variety of nozzles of both conical and semielliptical cross sections, offer wide versatility for testing both large flat-surface test objects and stagnation flow models that are fully immersed in the test stream.

The Arc Jet Complex can use 13,000 gallons of water per day of operation. In a typical year the Complex operates about 180 days and uses 2.34M gallons of water. Currently, Ames has scheduled opportunities to reduce the environmental impact of the Arc Jet by substituting recycled water for potable water and reducing air emissions by replacing its existing boiler with a new energy-efficient boiler.

Find out more about the Arc Jet at http://www.nasa.gov/centers/ames/research/technology-onepagers/arcjetcomplex.html

Land Use

Ames land use development areas include Bay View, Ames Campus, NASA Research Park, Eastside Airfield and Wetlands.

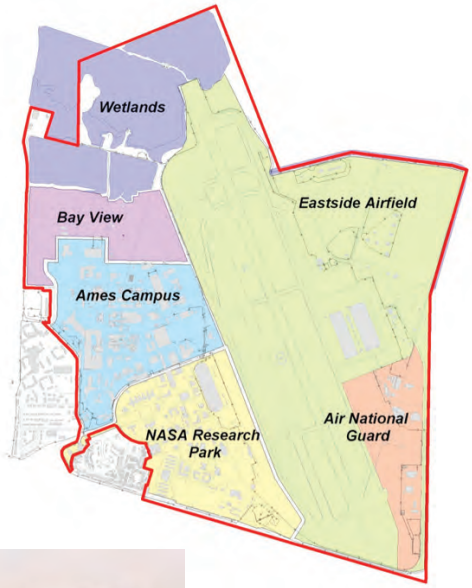
EO 13514 AGENCY-WIDE GOALS FOR ADVANCING REGIONAL AND LOCAL INTEGRATED PLANNING BY:

1. Participating in regional transportation planning and recognizing existing community transportation infrastructure.
2. Aligning Federal policies to increase the effectiveness of local planning for energy choices.
3. Ensuring that planning for new Federal facilities or new leases includes consideration of sites that are pedestrian friendly, near existing employment centers, and accessible to public transit.
4. Identifying and analyzing impacts from energy usage and alternative energy sources in all Environmental Impact Statements and Environmental Assessments for proposals for new or expanded Federal facilities under the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.).

At approximately 1,800 acres, Ames land use development areas include Bay View, Ames Campus, NASA Research Park, Eastside Airfield and Wetlands. NASA Ames Research Center twenty- year Master Plan (ARC MP FY 2010- 2032) provides a framework for real property development and identifies land use and facility requirements in support of Ames and the Agency mission, vision, and the guiding principles.

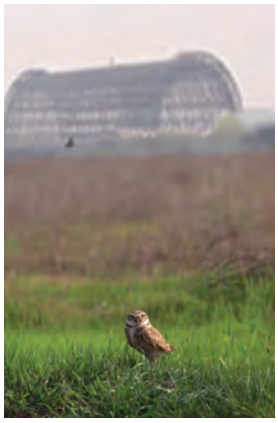
The ARC Master Plan (MP) is a comprehensive, all inclusive process that includes the baselines of existing conditions, future mission and real property development requirements, sustainability, and collaborative partnership projects. Existing green features contribute considerably to meeting the environmental performance standards for facilities. Ames brownfield development, access to public transportation, protecting natural habitats, and maximizing open space are among many features that provide an opportunity for reducing environmental impact and approaching green building design in a broader context.

Aerial of Ames showing surrounding property and bay wetlands.



Right: 2009 Planning areas map of Ames Research Center and included Areas

Below: Burrowing Owl Nesting Habitat Preserve at Ames



The life cycle cost analysis demonstrates the validity of replacing existing facilities beyond their life cycle with efficient, effective, and sustainable new facilities. Ames Sustainability Base, the first new building of this scope in decades, is the result and the cornerstone of the approved ARC FY 2005-2025 master plan. The ARC FY 2010-2032 MP is structured to be a solid foundation for the future real property development decision-making process. However, as a living document, the ARC MP is flexible to accommodate changes and transformation in all areas including mission and climate. NASA Ames is continuing to implement redevelopment of the formal Naval Air Station Moffett Field as the NASA Research Park under the 2002 NASA Ames Development Plan Environmental Impact Statement and Record of Decision. The ARC 2010-2032 MP also implements the Record of Decision. The Ames twenty-year Capital Investment Program Plan maps out future sustainment, renewal, and transition facilities and infrastructure projects.

Natural Resources

Ames is responsible for stewardship of natural resources.

EO 13514 AGENCY-WIDE GOAL FOR ADVANCING REGIONAL AND LOCAL INTEGRATED PLANNING BY:

1. Coordinating with regional programs for Federal, State, tribal, and local ecosystem, watershed, and environmental management.

Wildlife Habitat Protection

The saltwater marshes, wetlands, and grasslands at Ames are home to several protected species, including the Western burrowing owl, gray fox, salt marsh harvest mouse, salt marsh common yellowthroat, clapper rail, snowy plover, loggerhead shrike, white-tailed kit, Northern harrier, golden eagle, horned lark, American peregrine falcon, and the Western pond turtle. Mitigation measures have been taken to reduce human impact and protect these species. For example, approximately 80 acres of burrowing owl habitat are protected as preserves. Throughout 2012 Ames has maintained efforts to enhance owl preserves with artificial burrows and landscaped features. The number of owls varies from year to year, but generally 15 to 25 pairs are present during the breeding season.

Top: Salt marsh harvest mouse

Middle: Gray fox

Bottom: Clapper Rail

The number of salt marsh harvest mice at Ames is unclear since the U.S. Fish and Wildlife Services grants few permits to survey these animals due to the concern their delicate habitat would be damaged by surveying. Instead, pickleweed sites are cordoned off during activities that could impact the species.

Ames is a member of Partners-in-Flight, an international partnership sponsored by the Federal government to conserve migratory birds in the Western Hemisphere under several treaties. Ames is responsible for one of the few remaining populations of burrowing owls in the San Francisco Bay area and is implementing a management plan consistent with the Migratory Bird Treaty Act and in support of Partners-in-Flight goals. A survey of Western pond turtles has been completed.

Urban Wildlife

Ames also hosts common species such as skunks, gophers, tree squirrels, pigeons, and rats. Ames implements an Integrated Pest Management Program in collaboration with the U.S. Fish and Wildlife Service, California Department of Fish and Game, and local entities. Ames is working to eliminate food sources such as open dumpsters, artificial feeding, and landfills to prevent these species becoming wildlife pests. The Environmental Management Division offers wildlife awareness training, which includes emergency response procedures for wildlife, such as how to handle a distressed animal.

In 2012, Ames entered into a Space Act Agreement with a Palo Alto veterinary clinic in order to provide for the spaying and neutering of feral cats caught at the Center.

South San Francisco Bay Salt Pond Restoration Project

In 2010, Ames acquired the Northern Channel (or Moffett Channel) from Cargill for storm water management and spill control. Ames granted an easement to the U.S. Fish and Wildlife Service to manage the Moffett Gap portion of the 500-mile Bay Trail. In September 2010, the Moffett Gap was opened to the public, thereby contributing to the public access goals of the interagency Salt Pond Restoration Project. The Navy, in coordination with NASA, has cleaned up contamination in the Northern Channel and restored vegetation. NASA and the Navy have worked together to conserve the Western pond turtle.

Left: Photo taken of wetlands area next to Ames

Right: Goat from herd used to maintain vegitation growth

Goats

Ames utilizes a goat herd to maintain vegetation in areas of the center which are hard to reach using conventional mowers. This is a low cost solution to maintaining and enhancing the burrowing owl habitat, as the goat dung attracts insects on which they prey.

Native Plants

Ames participates in the federally led Plant Conservation Alliance. In furtherance of Federal goals to restore native plants and mitigate invasive species, Ames has converted several areas to California drought resistant native plants.

Climate Change

Climate change is a long-term change in the statistical distribution of weather patterns over periods from decades to millions of years.

EO 13514 AGENCY-WIDE GOAL FOR CLIMATE CHANGE:

1. Develop an Agency-wide goal for greenhouse gas reduction and obtain White House, Office of Management and Budget, approval.
2. Develop an Agency-wide Adaptation Strategy.

Climate change reflects a change in the energy balance of the climate system. Ames is cooperating with NASA Headquarters by hosting and participating in workshops and symposiums on climate change topics. These workshops and symposiums represent constructive steps toward meeting NASA's goals under the Executive Order.

Emerging Recommendations

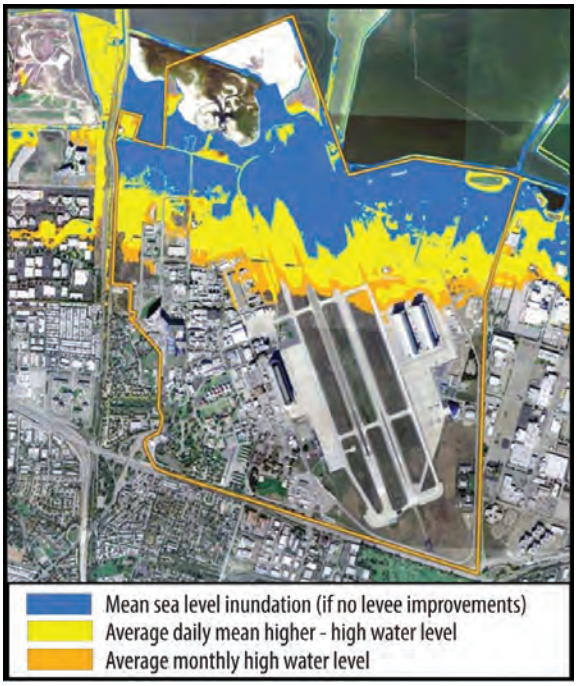
Climate change in the future is anticipated to cause a change in habitats for many plant and animal species.

Additionally, climate change can alter the frequency, duration or severity of weather systems. The following are the mitigation recommendations discussed at the 'Resilience and Adaptation to Climate Change Risks Workshop and Symposium,' held in February 2011 at Ames and under continuing study today.

- *Reduce current stresses on habitats, e.g. invasive species.*
- *Reduce current contamination.*
- *Maintain corridors for plants and animals to move.*
- *Monitor change of species at Ames, e.g. rattlesnakes.*
- *Manage stormwater.*
- *Plan for extreme events, e.g., work schedules, safety plans and emergency response.*
- *Coordinate with the Army Corps of Engineers in planning levee upgrades.*
- *Use the Ames Master Plan process to address flood and salt water intrusion risk to infrastructure.*

Potential Water Inundation

The image to the upper right shows the potential inundation due to rising sea levels in the San Francisco Bay, assuming no improvement in the levee system, no subsidence, and no increase in tidal amplitude. This image also assumes a year 2000 baseline water level.



Shoreline Study

Ames slopes from grassy uplands to marsh. Northern areas are below mean sea level due to past agricultural pumping. The center is protected from flooding by levees and is a cooperating Agency with the U.S. Army Corps of Engineers in its Shoreline Feasibility Study to determine whether and how to upgrade the levees to protect against sea level rise.

Above: Potential innundation due to rising sea levels in the San Francisco Estuary and Watershed

Left: Associate Directory, Steven Zornetzer addressing the audience at the Resilience and Adaptation to Climate Change Risks Workshop

Transportation

Green transportation revolutionizes the way people get around and is critical to mitigating the effects of climate change.

EO 13514 GOALS TRANSPORTATION

1. Reduce petroleum consumption by 2% per year through FY 2020 (applies to agencies with fleets of more than 20 vehicles) (Baseline FY 2005).
2. Use low greenhouse gas emitting vehicles, including Alternative-Fuel Vehicles (AFV), and optimize the number of vehicles in agency fleets.
3. Participate in regional transportation planning & recognizing existing community transportation infrastructure.
4. Ensure that planning for new Federal facilities or new leases includes consideration of sites that are pedestrian friendly, near existing employment centers, and accessible to public transit, and emphasizes existing central cities and, in rural communities, existing or planned town centers.
5. Develop and implement innovative, Agency-specifi c policies and practices to reduce GHG emissions (e.g., from commuting) in Agency operations.

Green transportation revolutionizes the way people get around and is critical to mitigating the effects of climate change. Transporting people and goods encompasses ~30% of the total energy used in the United States.

Environmentally Responsible Aviation

Ames has been working on projects that strive to reduce the impact of aviation on the environment. These projects are aimed at improving aircraft fuel efficiency, developing the next generation of efficient air traffic control, and creating new technologies and systems engineering processes to advance the future of carbon-neutral air transportation.

Future Air-Traffic-Management Concepts Evaluation Tool (FACET)

FACET is an Ames developed flexible software tool that provides powerful simulation capabilities and can rapidly generate thousands of aircraft trajectories to enable efficient planning of air traffic flows. It equips service providers with a way to explore, develop and evaluate advanced air transportation concepts before they are field-tested and developed into tools ready for operational use. FAA traffic flow managers and commercial airline dispatchers have used FACET technology for real-time operations planning. FACET integrates live air traffic data from FAA radar systems and weather data from the National Weather Service to summarize National Airspace Systems (NAS) performance. This information allows system operators to reroute flights around congested airspace and severe weather to maintain safety and minimize delay.

EGT Airship Bullet

In 2011, the world's largest and greenest operating airship, Bullet 580, based its West Coast operations at NASA Ames. The 235-foot long, 65-foot diameter lighter-than-air vehicle, which can fly at speeds up to 74 mph, is newly designed and manufactured by E-Green Technologies, Inc., and is considered radically different in design, moving beyond the performance limitations of traditional blimps. It combines advanced technology with simple construction, and the ability to fuel with algae-based bio-fuel, protecting our environment. Missions for the 'Bullet' include communications relay, airspace and maritime surveillance, and weather and environmental monitoring, as well as providing long endurance platforms for geophysical surveys, and monitoring of oil spills and forest fires, among other civilian and military uses.

EGT Airship Bullet™ Class 580 after inflation in Farrett Coliseum, Alabama

Alternative Commute Programs

Ames has promoted programs such as ride sharing, telecommuting, offering subsidized employee public transportation passes, and Bike-to-Work-Day.

Ames Motor Pool

NASA Headquarters identified Ames with the oldest fleet and therefore, requested vehicles to be replaced by U.S. General Services Administration under the American Recovery and Reinvestment Act of 2009. As a result, the Ames Motor Pool received nine (9) new vehicles (3 hybrids, 1 minivan (E85) and 5 flex fuel trucks (E10).

Flex fuel van from the Ames motor pool

Air

As an active research center, Ames requires clean air in its operations, yet under various regulations these operations are permitted to generate air pollution.

EO 13514 AGENCY-WIDE GOALS FOR AIR QUALITY:

1. Pursue opportunities with vendors and contractors to reduce greenhouse gas (GHG) emissions (e.g., transportation options and supply chain activities).
2. Develop and implement innovative, Agency-specific policies and practices to reduce GHG emissions from commuting during Agency operations.
3. Decrease use of chemicals directly associated with GHG emissions.

Ames maintains a comprehensive air quality monitoring program. The data is used to make informed decisions on how to demolish or retrofit older buildings and design and operate new buildings to assure a healthy work environment. Additionally, carbon dioxide (CO_2) is emitted into the atmosphere as a result of Ames' energy usage. To reduce adverse impacts to air quality, Ames has undertaken several initiatives - some are highlighted here.

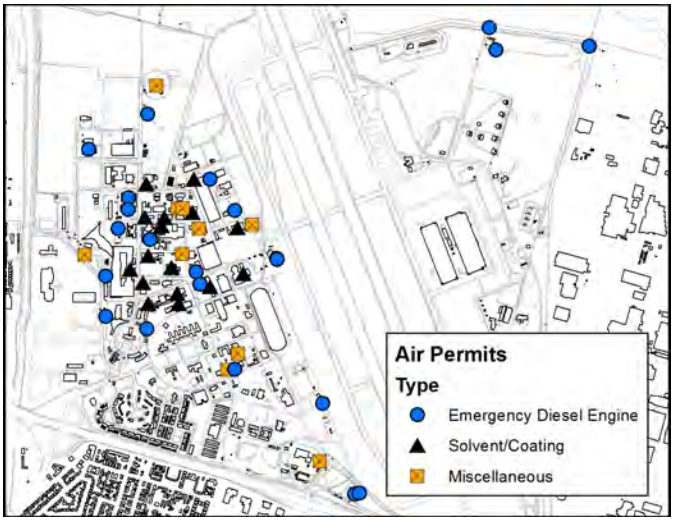
Fleet Management

The Ames Transportation Office manages a fleet of flex-fuel vehicles leased from the General Services Administration. These vehicles can use either ethanol or gasoline. In addition, compressed natural gas (CNG) vehicles and electric drive vehicles are in use, and green products are used to maintain them.

Synthetic Minor Operating Permit

The Bay Area Air Quality District issues the Synthetic Minor Operating Permit under the Federal Clean Air Act for air quality operations at Ames. The permit addresses requirements to track greenhouse gas emissions. Qualifying for this permit reduces costs to NASA Ames by approximately $100,000 annually, compared to the higher level CAA Title V permit otherwise required.

Below: Air permits map for Ames



Boilers

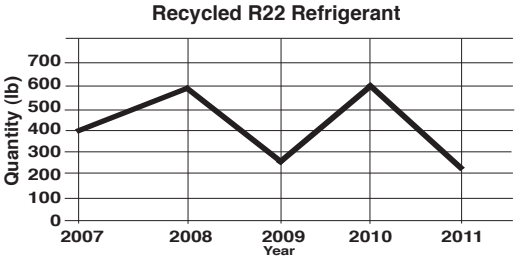
Ames has replaced 16 of the 27 boilers under the utility energy service contract to improve energy efficiency. The remaining boilers will be upgraded, replaced, or retired to comply with the new BAAQMD regulations. This project is ongoing and will take several years to complete.

NOX Scrubber

Ames is upgrading the Arc-Jet NOX scrubber, after 30 years of use, to meet new regulations for air emissions.

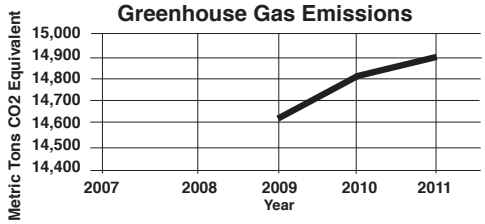
Ozone Depleting Substances (ODS)

NASA Ames stored approximately 11,283 pounds of ODSs on-site with halon 1211 and 1301 fire extinguishers accounting for approximately 93% of the total quantity. Ames used approximately 211 pounds of R-22 and 7 pounds of R-502 for recharging HVAC equipment. Additionally, Ames collects old refrigerators and air conditioning units prior to disposal and removes the refrigerant for recycling.



Green House Gas

NASA Ames emitted approximately 14,912 metric tons of carbon dioxide equivalents (MTCO2e) during CY2011 according to requirements of the Environmental Protection Agency's Greenhouse Gas Mandatory Reporting Rule (EPA GHG MRR). Emissions are lower than the 25,000 MTCO2e threshold for reporting in CY2011.



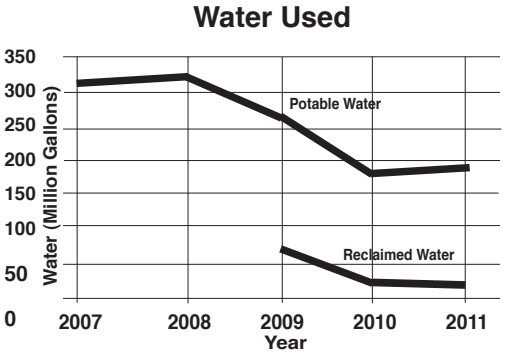
Water

Ames continues to reduce its use of potable water in order to meet the requirements of Executive Orders 13423 and 13514 by reducing water use intensity in its processes and using reclaimed water instead of potable water where feasible.

EO 13514 Agency-wide Goals to Improve Water Use Efficiency and Management:

1. Reduce potable water consumption intensity by 2 percent annually through fiscal year 2020, or 26 percent by the end of fiscal year 2020, relative to a baseline of the Agency's water consumption in fiscal year 2007, by implementing water management strategies including water-efficient and low-flow fixtures and efficient cooling towers.
2. Reduce agency industrial, landscaping, and agricultural water consumption by 2 percent annually or 20 percent by the end of fiscal year 2020 relative to a baseline of the agency's industrial, landscaping, and agricultural water consumption in fiscal year 2010.
3. Consistent with State law, identify, promote, and implement water reuse strategies that reduce potable water consumption.
4. Implement and achieve objectives identified in the USEPA storm water management guidance.
5. Manage existing buildings to reduce water consumption.
6. Ensure 95% of all new contracts, including non-exempt contract modifications, require products and services that are water-efficient.

Water used at Ames Research Center is comprised of both potable water and reclaimed water. Water tracked in the graph is the total water used at Ames Research Center/Moffett Field. For the Executive Order 13514 we track the use of potable water used on the Ames Campus only. The water used on the Ames Campus is a subset of the total shown in the graph, and was 160 MGY in FY2007, which is the baseline year that the goal reductions are measured against. Executive orders require that water used on the Ames Campus be reduced 16% by 2015 and 26% by 2020.



Converting the golf course irrigation water from the potable water source to the reclaimed water source in 2009 produced dramatic reductions in use of potable water. The Golf Course is a recreation function of the Ames Exchange located on the Eastside Airfield. We saw a general decrease in potable water used in other areas but were unable to precisely locate where those reductions are occurring due to a shortage of meters. As funds become available, new meters are being installed which will provide more data on water consumption. The EO 13423 goal of a decrease in potable water use of 16% by 2015 from the baseline year of 2007 for Ames water use has already been achieved by the golf course conversion to reclaimed water. The EO 13514 goal of a total decrease of 26% by 2020 requires additional conservation efforts.

Alana Lee of the Environmental Protection Agency discusses regional groundwater and its effects on the area

The start-up in FY 2013 of the Ground Water Reuse Project (GWRP) at the N-271 Water Treatment Facility is projected to provide the additional savings of potable water required by the 2020 goal. The N-271 Water Treatment Facility takes ground water from pumping stations at Ames and conditions it for industrial water use in both the Arc Jet Complex and the Unitary Plan Wind Tunnel. The GWRP was initiated with the award of a $2.6 Million Strategic Institutional Investment (SII) proposal in 2009 as a joint project between the Thermo-Physics Facilities Branch, the Facilities Engineering Branch, and the Environmental Management Division. The primary purpose of the GWRP is to reduce the risk to the operations of both the Arc Jets and Unitary Wind Tunnel by securing a dependable supply of water. A reliable source of process water is essential to the operation of the Arc Jets and the Unitary Plan Wind Tunnel. Both of these facilities are recognized and funded by the Strategic Capabilities Assets Program (SCAP) and the Aeronautics Test Program (ATP) as Agency-critical Design, Development, Test, and Evaluation (DDT&E) facilities with enabling or critical path participation in the current Agency Mission Planning Model (AMPM).

Energy

Effective energy management is crucial to Ames' sustainability due to the Center's requirements for both electricity and natural gas for its power.

EO 13514 AGENCY-WIDE GOALS FOR ENERGY:

1. Increase renewable energy and renewable energy generation on agency property.
2. Align Federal policies to increase effectiveness of local planning for energy choices.
3. Identify and analyze impacts from energy usage and alternative energy sources in all Environmental Impact Statements and Environmental Assessments for new or expanded Federal facilities proposals.
4. Ensure all new Federal buildings planned post-2019 achieve zero-net-energy standards by 2030.
5. Manage existing buildings to reduce energy consumption.
6. Ensure 95% of all new contracts, including non-exempt contract modifications, require energy efficient products and services.

Major energy users at Ames are the supercomputing facilities, wind tunnels, and the Arc Jet Facility. Base power demand is 10 to 20 megawatts, but peak demand can be up to 150 megawatts when the wind tunnels and the arc jet are running.

Energy reliability hinges on supply, quality and price. Currently Ames purchases electricity from Western Area Power Authority (WAPA), the majority of which is supplied by large scale hydroelectric dams. WAPA power is delivered to Ames over Pacific Gas & Electric (PG&E) power lines originating near the town of Tracy in the Central Valley. WAPA allots Ames 5.3 percent of the daily generating capacity of WAPA hydroelectric dams. This allotment varies day to day as well as seasonally. The price for electricity also varies based on the volume of water available to WAPA. When WAPA has abundant water, Ames' cost per kilowatt hour falls. When the hydro water volume decreases as in a drought, NASA's costs may increase. When Ames exceeds WAPA's electricity allotment, WAPA purchases power for Ames on the open market through the California Independent Systems Operators (CAISO). Power purchased from CAISO is generally more expensive than WAPA power.

Ames uses natural gas for space heating water, and some back-up power systems. Natural gas is provided to NASA Ames by PG&E via the Defense Energy Support Center. The Ames Facilities Engineering Branch has a number of energy-conserving projects, a few are discussed below.

Fuel Cells

Fuel cells generate "clean" electric power through a highly efficient electrochemical process that all but eliminates air pollutants and drastically reduces greenhouse gases. Ames has two sites for fuel cells, one near the Sustainability Base N-232 building and the other at the 12-Foot Pressure Wind Tunnel. At the site of Sustainability Base N-232, a solid oxide fuel cell produced by Bloom Energy has been installed and is now generating electric power for use throughout the center. At the wind tunnel, a 12kW fuel cell will serve as a backup power source to the DCS Data Systems and Emergency Lighting. This fuel cell is part of the promotional backup power fuel cell deployment project of the U.S. Department of Energy. Site analysis at Ames has been approved and the Department of the Army is responsible for procurement of the fuel cell, installation, and five years of operations and maintenance.

Bloom Energy Box, outside of the Sustainability Base uses solid oxide fuel cell technology to produce "clean" electricity

Utility Energy Services Contract

Using PG&E's Utility Energy Services Contract program, Ames has initiated a design-build plan to implement a variety of energy efficiency and renewable energy conservation measures including installation of a 98 kW photovoltaic system, installation of new high-efficiency Heating, Ventilation, and Air Conditioning (HVAC) equipment to replace aging and energy-intensive systems, expansion of the energy management control system, installation of a small fuel cell, and implementation of a center-wide retro-commissioning program. Currently Ames has replaced a total of 16 boilers including an old steam boiler in the basement of N-200.

Street and Parking Lot Lights

In cooperation with Relume Technologies, Ames installed prototype LED streetlights around our administration building. These streetlights have an expected life of 10,000 hours and will use 90 percent less power than the existing streetlights. As a result of the success of these proto-type LED street lights Ames incorporated a plan to upgrade all street and parking lot lights to LED fixtures as part of the UESC with PG&E.

Street lights outside of the NASA Lodge at Ames

Solar Panels

Two of Ames' buildings have rooftop photovoltaic solar panels, which provide 11kW of power. To promote energy conservation, monthly energy use is posted on an electronic sign at the main entrance to the Center.

Building N245 roof with solar panels

Nebula Data Center

Cloud Computing

The Nebula project moves Ames toward the use of Cloud Computing. Nebula uses a containerized data center to house servers on the NASA Ames campus. These containers are the "greenest" form of a data center due to their inherent density. Nebula also makes Cloud Computing more efficient by turning physical hardware off when not needed. Estimates show Nebula to be 50% more energy efficient than traditional data centers.

Waste

Ames has programs that recycle various hazardous and non-hazardous solid waste streams.

EO 13423 AND 13514 AGENCY-WIDE GOALS FOR WASTE REDUCTION:

1. Increase source reduction of pollutants and waste.
2. Divert at least 50% non-hazardous solid waste (including C&D materials) by FY 2015.
3. Reduce copier paper use.
4. Increase use of uncoated copier and writing paper containing at least 30% post-consumer fiber.
5. Reduce and minimize the acquisition, use, and disposal of hazardous chemicals and materials.
6. Increase diversion of compostable and organic materials from the waste stream.
7. Implement integrated pest management and landscape management practices to reduce and eliminate the use of toxic and hazardous chemicals and materials.
8. Increase Agency use of acceptable alternative chemicals and processes.
9. Decrease Agency use of chemicals to assist Agency in achieving FY 2020 GHG reduction targets.
10. Report in accordance with Sections 301 and 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986.

Solid Waste

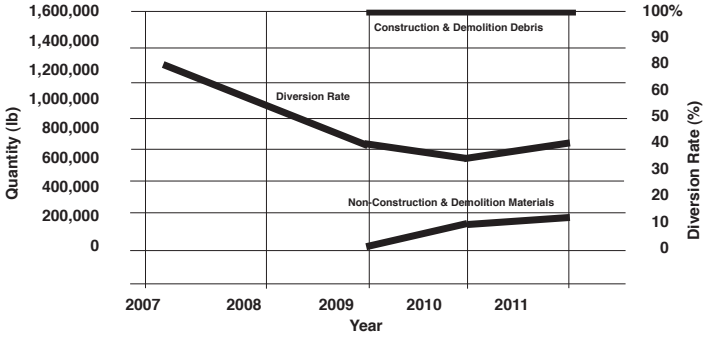
Ames generated a total 5,592,885 lbs of solid waste in FY 2011 from research, operations, and construction and demolition (C&D) activities. The Center recycled approximately 24 % of its non-hazardous solid waste, 99 % of its C&D waste and 100% of green waste from landscape service during FY2011.

C&D Solid Waste	Quantity
Concrete	2,536,760
Clean Fill	31,590
Lumber	17,700
Copper	6,400
Scrap Metal	1,538,100
C&D Debris	247,740

Institutional Solid Waste	Quantity (lbs)
Cardboard	895,716
Cooking Oil/Grease	8,448
Drums	4,620
Fluorescent Lamps	13,764 units
Lumber	243,000
Mixed Paper	198,180
Tires	84 units
Toner Cartridges	1,266 units
Green Waste	233,100

Table 1: Non-Hazardous Solid Waste Recycling FY2011

Recycled Solid Waste



Hazardous Waste

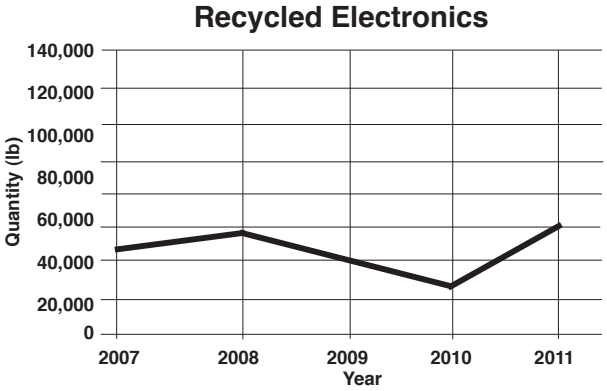
Ames complies with the Resources Conservation and Recovery Act (RCRA) cradle-to-grave requirement, and other Federal, State, and local hazardous material and waste requirements. In CY 2011, Ames shipped 454,571 lbs of hazardous waste offsite for proper disposal and recycling. Of the total onsite hazardous waste, 46% was sent to landfill and 42% was recycled. The remaining waste was disposed via incineration (6.4%), fuel blending (3%), neutralization (0.5%), metals recovery (1.3%), or returned and reused (0.1%). Most of the hazardous waste at Ames is generated by clean-up and maintenance operations. Oil, oily water, and fuel contaminated water accounted for approximately 33% of the hazardous waste shipped. The top 10 waste types account for 90% of hazardous waste shipments (see Table 2). The Ames Chemical Exchange (ACE) accepts donations of Ames' hazardous materials that have been purchased but not opened, and makes them available to other members of the NASA Ames community. ACE saves the Center money by avoiding unnecessary purchases and avoiding disposal costs.

Hazardous Waste Type	Quantity Shipped
Oil Water, Oil, Fuel Water	153766
Tanks	128043
Batteries	31451
Soil	29861
Debris Non-RCRA	17845
Asbestos Debris	16197
PCB Materials	9080
Drum	9078
Aqueous Solution	8360
Fuel	6729

Table 2: Top 10 Hazardous Waste Types NASA Ames CY2011

Electronic Waste Reduction

NASA Ames has an established program for managing electronics recycling. Computers, LCDs, CRTs and other electronics are reused, sold, donated or recycled (see Table 3). NASA Ames also participates in the Federal Electronics Challenge (FEC), which encourages Federal agencies to improve their electronic product stewardship. In previous years, Ames has won FEC Silver and Bronze awards. Additionally, The Ames Child Care Center has sponsored several household electronic waste recycling events for the community.



E-Waste FY 11	Reused	Donated	Recycled	Sold	Landfill	Other
Desktop Computers	20	—	669	—	0	48
CRT Monitors	0	—	678	—	0	0
LCD	110	—	291	—	0	72
Notebook Computers	5	—	708	—	0	70
PDAs	—	—	250	—	—	—
Mixed Electronic Products	—	—	67,854	—	—	—
Mobile Phones	—	—	50	—	—	—

Table 3: Electronics Disposition FY 2011

Material

Ames strives to procure recycled content, biobased, energy-efficient, and environmentally preferable products.

EO 13514 AGENCY-WIDE GOALS FOR MATERIALS:

1. Promote pollution prevention, recycling, and sustainable acquisition: 1) Ensure 95% of all new contracts require products and services to be energy-efficient, water-efficient, biobased, environmentally preferable, non-ozone depleting, contain recycled-content, non-toxic or less-toxic alternatives; 2) Minimize generation of waste and pollutants through source reduction; 3) Divert at least 50% of non-hazardous solid waste, construction and demolition debris, by the end of FY 2015; 4) Reduce copier paper use and acquire uncoated copier and writing paper containing at least 30% post-consumer fiber; 5) Reduce and minimize the quantity of toxic and hazardous chemicals and materials acquired, used, or disposed of; 6) Increase diversion of compostable and organic material from the waste stream; 7) Implement integrated pest management and other appropriate landscape management practices; 8) Increase agency use of acceptable alternative chemicals and processes in keeping with the Agency's procurement policies; 9) Decrease Agency use of chemicals when this will assist in achieving greenhouse gas emission reduction targets; 10) Report under sections 301 through 313 of the Emergency Planning & Community Right-to-Know Act of 1986.
2. Promote electronics stewardship, in particular: 1) Ensure procurement preference for EPEAT-registered electronic products; 2) Establish and implement policies to enable energy-efficient or environmentally preferable features on all eligible electronic products; 3) Employ environmentally sound practices with respect to the disposition of excess or surplus products; 4) Procure Energy Star and FEMP designated electronic equipment; 5) Implement best practices for energy-efficient management of servers and Federal data centers

Ames strives to procure recycled content, biobased, energy-efficient, and environmentally preferable products (EPP) to meet the EPA Comprehensive Procurement Guidelines (CPG) and the U.S. Department of Agriculture's biobased product requirements. Buying EPPs has provided many benefits, including supporting a market for recycled and energy efficient products, protecting employee health, and protecting the environment. As an example, the Logistics and Documentation Services Division specifies the purchase of Green Seal certified products for hand cleaners, sanitizers, and floor strippers for janitorial services.

Ames purchased approximately $623,000 in green designated items. 96 % of the purchases were for products made with the highest recycled and biobased content level practicable. Ames purchased 26 of the 73 designated products listed in the NASA Environmental Tracking System plus an additional non-designated item containing recycled or biobased content.

As a member of the Federal Electronics Challenge (FEC), Ames works to improve electronic product stewardship. As a result of Ames commitment to electronic product stewardship Ames was awarded the Bronze FEC this year. Table 1 shows (for fiscal year 2011) all the computers and monitors reported as purchased were rated as EPEAT Gold. Ames is currently working to implement additional actions that will improve electronic product stewardship, including increasing the use of lower standby power functions and duplex copying.

Mark Reiss, GSA customer Service Director, FAS, San Francisco, spoke at the 2012 Earth Day Panel on "How Sustainability is Driving Change in the Federal Workplace.

Knowledge Sharing

The Environmental Management Division works with the Acquisition Division and the Chief Information Officer to share information with the Ames community about environmentally preferable products and EPEAT computers.

Electronic Product Purchased in FY2011	Number	Percent EPEAT Gold
Desktop Computers	997	100%
Liquid Crystal Display (LCD) Monitors	2,000	100%
Laptop/Notebook Computers	1,073	100%

Table 1: Electronic Product Purchases FY 2011

Hazardous Material Information Management System

The Environmental Management Division is upgrading its system to reduce the time that researchers and other Ames staff spend on inventory tracking and reporting. The upgrade is also expected to reduce inventory tracking errors, and may allow researchers to reduce their chemical inventory.

NASA Ames purchased nearly $644,000 in designated recycled and biobased content products. Approximately 24 % of non-hazardous solid waste and 99% of construction and demolition (C&D) waste was recycled during FY2011. Ames far exceeds the 50% diversion rate for C&D waste but needs to increase efforts to meet a 50 % diversion rate for non-hazardous solid waste as required by Executive Order (EO) 13514.

Item	Total Amount Purchased	Amount Purchased Containing Recycled/Biobased Content	Total Units Purchased	Total Units Purchased Containing Recycled/Biobased Content	Difference Recycled/Biobased Purchases FY 2010
EPA Designated Recycled Content Products					
Commercial Sanitary Tissue Products	$100,577	$99,977	3,653	3,643	7%
Uncoated Printing/Writing Paper	$171,684	$171,670	424,000	423,960	N/A
Paper & Paper Products	$2,135	$927	57	16	99%
Binders	$12,002	$12,002	2,221	2,221	6%
Toner Cartridges	$3,439	$2,773	37	32	63%
Plastic Desktop Accessories	$3,329	$3,329	206	206	13%
Plastic File Folders	$213	$213	12	12	37%
Office Furniture	$34,349	$34,349	160	160	27%
Plastic Trash Bags	$39,082	$39,082	23,235	23,235	13%
Blasting Grit	$2,514	$0	2,450	-	N/A
Motor Vehicle Tires	$8,294	$0	84	-	100%
Rebuilt Engine Parts	$5,384	$5,384	27	27	100%
Engine Coolants	$190	$0	14	-	0%
Sorbents	$30	$0	40	-	N/A
USD Designated Biobased Products					
Cleaners (General)	$256	$256	19	19	100%
Diesel Fuel Additives	$103	$103	2	2	100%
Disposable Containers	$36,677	$29,507	163,380	137,380	0%
Disposable Cutlery	$32,996	$32,996	1,886,000	1,886,000	0%
Disposable Tableware	$147,993	$147,993	199,063	199,063	0%
Engine Oil	$3,825	$2,890	1,304	1,100	9%
Floor Strippers	$1,406	$0	29	-	N/A
Glass Cleaners	$301	$216	49	39	100%
Grease	$370	$370	1	1	100%
Hand Cleaners and Sanitizers	$6,705	$6,705	277	277	100%
Industrial Cleaners	$3,114	$2,714	18	6	100%
Bathroom Cleaners	$5,763	$1,980	263	100	72%
Subtotal	**$622,730**	**$595,437**	**2,706,601**	**2,677,499**	
Non-Designated Items					
Biobased Fuel	141,476	$ 90,834.56	14,067	14,067	61%
Total	**$764,206**	**$686,271**	**2,720,668**	**2,691,566**	

Contamination Cleanup & Remediation

NASA is cleaning up contamination from past NASA activities and it is subject to site specific enforcement orders.

The purpose of NASA's Environmental Compliance & Restoration (ECR) Program is to clean up chemicals released to the environment from past activities. Cleanups are prioritized to ensure that the highest priority liabilities are addressed first in order to protect human health and the environment and preserve natural resources for future missions.

NASA Ames includes both the original Ames campus and a portion of the former Naval Air Station Moffett Field. NASA is cleaning up contamination from past NASA activities and it is subject to site specific enforcement orders.

NASA Cleanup Activities

NASA sources of contamination are also present on the Ames campus, and 13 areas of investigation have been established. The sites that overlie the MEW groundwater contamination are under the jurisdiction of the U.S. EPA, and those that do not overlie the groundwater contamination are under the jurisdiction of the CA EPA's Department of Toxic Substances Control. The status of cleanup ranges from ongoing investigation to clean closure. These contaminated sites introduce a variety of issues that increase the complexity of Center development under the NADP. In 2001, NASA prepared an Environmental Issues Management Plan, and compiled a Record of Decision in 2002, to address these matters, including protection of construction workers, the remediation systems in contaminated areas, and the disposal of contaminated soils and groundwater encountered during construction. All partners are required to comply with the associated Environmental Issues Management Plan.

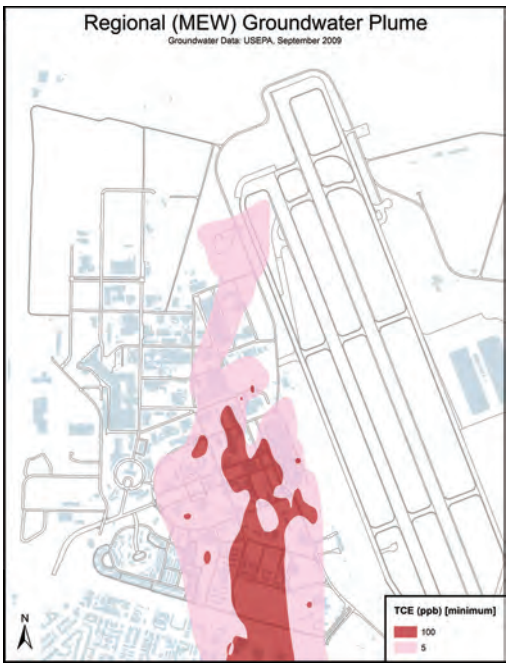
Additionally, Ames uses a variety of hazardous materials and generates hazardous waste in its operations and research. Typical hazardous materials include toxic gasses, acids, fuels and solvents. NASA Ames has a comprehensive Environmental Management System designed to ensure these materials are handled in compliance with Federal, State and local laws. Overall, current environmental management programs at Ames Research Center ensure that past contamination is remedied. Ongoing operations prevent or minimize pollution, and reduce emissions to the environment by complying with all environmental regulations.

Naval Air Station Moffett Field Cleanup Site

The former Naval Air Station Moffett Field has been designated a Superfund site by the U.S. Environmental Protection Agency (EPA). The U.S. Navy has identified multiple sources of contamination at Moffett Field, and the Navy is responsible for the cleanup under a Federal Facilities Agreement with the U.S. EPA, and the State of California. A variety of contaminants are present, including solvents, polychlorinated biphenyls, oils, greases and fuels.

MEW Study Area - A large area of shallow groundwater contamination has migrated onto Ames from three superfund sites bounded by Middlefield, Ellis and Whisman Streets (MEW). These sources of contamination are associated with the prior use of solvents by semiconductor companies no longer located in the area.

The contamination from these sources has combined with the Navy and NASA sources. This contamination is under the jurisdiction of the U.S. EPA and the California EPA's Water Quality Control Board. Cleanup by the MEW companies is subject to a consent order from the U.S. EPA. The status of cleanup ranges from investigation phase to treatment to clean closure.



Ames Award Winners

CEIL Award Winner

Washington, DC, November 23, 2011

Rosalind Grymes accepting CEIL Award

Rosalind Grymes accepted for the Ames Sustainability Base Project, the 2011 Leadership in Innovation Award from The Center for Environmental Innovation and Leadership (CEIL).The award was presented to Ames for employing a novel approach to achieve one or more environmental objectives using technology, management, financing, and public-private partnerships. The CEIL awards highlight excellence in developing and implementing innovative environmental programs to improve environmental quality, reduce greenhouse gas emissions, or increase use of renewable energy and bio-preferred products.

FEC Bronze Award Winner

Washington, DC, August 13, 2012

FEC Bronze Award

The U.S. Environmental Protection Agency and the Office of the Federal Environmental Executive announced Ames Research Center as a recipient of the 2012 Federal Electronics Challenge (FEC) Bronze Award. The 2012 FEC Bronze Award was given to Ames Research Center for savings in FY2011 electronics stewardship resulting in greenhouse gas emissions reductions. Ames completed all applicable general mandatory activities and all life-cycle mandatory activities in one of three electronics stewardship life-cycle phases.

Sustainability Award Winners

Ames Research Center, April 26, 2012

The NASA Ames 2012 Sustainability Awards Ceremony was held at Ames on April 26. Awards were presented to the N-232 Sustainability Furniture Team and The Climate Adaptation Science Investigation (CASI) Team.

The N-232 Sustainability Furniture Team with representatives from the Office of the Chief Financial Officer, Acquisitions, Earth Science, Project Management, and the Associate Center Director (Mission) was recognized for establishing blanket purchase agreements with dealers and manufacturers listed on the GSA Sustainable Solutions Multiple Award Schedules. The team's efforts facilitated purchasing environmentally friendly furniture not only for Sustainability Base, which assured its LEED Platinum rating, but as needed elsewhere at the Center. The award was presented by Dr. Ann Clarke, Assistant Director of Center Operations.

Furniture Team (left to right): Mark Reiss, GSA customer Service Director, FAS, San Francisco, Kevin Werner, Uyen Tu, Ronnee Gonzalez, Robert Brummett, Krisstina Wilmoth, Edwin Sheffner, and Dr. Ann Clarke, Christine Scofield (not shown).

Climate Adaptation Science Investigation (CASI) Team, with representatives from Earth Science, Facilities Engineering, and the Associate Center Director (Mission) were recognized for their collaboration in downscaling and presenting climate data to the community for use in developing adaptation strategies. The Environmental Management Division, was a collaborator, but was not eligible for this award since it administers the award program. The award was presented by Dr. Ann Clarke, Assistant Director of Center Operations.

CASI Team (left to right): Dr. Steven Zornetzer, Dr. Cristina Milesi, Dr. Rose Grymes, Dr. Laura Iraci, Dr. Max Loewenstein, Dr. Ann Clarke, Joseph Skiles (not shown), Soheila Dianati (not shown)

National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, CA 94035-1000

www.nasa.gov

NP-2013-03-01-ARC